ON CERTAIN CASES OF THE DIMINUTION OF WIND VELOCITY WITH ALTITUDE.

By ALBERT BALDIT.

[Abstracted from Comptes Rendus, Paris Acad., June 16, 1919, pp. 1211-1214.]

In general, winds increase in velocity with altitude, but this is true mainly with the mean of a large number of cases. When the observations are taken separately, however, they can be divided into several groups, and so classified as to bring out certain conditions which persistently produce a diminution of wind speed with altitude. The material for the investigation was obtained from a large number of observations made near Chalons-sur-Marne, from September, 1915, to March, 1918, and in this time there were observed 250 cases where wind speed decreased with altitude. Many of these have been classified as follows:

1. Winds between north and east, from surface to 4,000 meters (67 cases).
2. Winds between east and south, from surface to 4,000 meters (24 cases).
3. Winds between east and south, from surface to 3,000 meters; and then from south to west (13 cases).

The first type occurs with an area of high pressure having its major axis southwest to northeast and centered over the North Sea or Scandinavia. Thus, the measures were made in the southeast quadrant of the anticyclone under fine weather conditions. Under such conditions there is a diminution of the wind velocity at a varying altitude and a backing of the wind with increasing altitude. The second type occurs when the anticyclone covers central Europe and has its major axis directed northwest and southeast. Here the measures are made in the southwest quadrant of the formation. The third type occurs after the passage of an anticyclone which is followed by an important fall of the barometer.

The gradients of pressure required at each height to account for the observed changes of wind are found to be in agreement with those deduced from the surface gradient and the actual distribution of temperature both horizontally and vertically.[1]—*C. L. M.*

[1] This paragraph is from another abstract of the same paper, *Sci. Abs.*, sec. A, Sept 30, 1919, §1160.

THE PREVAILING WINDS OF THE NORTH PACIFIC COAST.

By Professor A. E. CASWELL.

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[Excerpted from paper read before the American Meteorological Society, New York City, Jan. 3, 1920.]

From a consideration of the planetary circulation of the atmosphere, it appears that in the northern hemisphere the prevailing winds in the region immediately to the south of the center of the 30° high-pressure belt are to be expected to blow from the northwestern quadrant. Similarly, north of the 60° low-pressure belt the prevailing winds are to be expected from the northeastern quadrant, while between these two belts they should be from the southwestern quadrant.[1] * * *

The passage of HIGHS and LOWS will modify the prevailing winds only slightly. * * * Assuming that the LOWS travel due east, which is approximately true in the Pacific Northwest, at points south of the path of a LOW center comparatively cold winds from the southeast may be expected as the storm first approaches. Then soon after precipitation begins the wind will change to the southwest, becoming much warmer. Finally, when the storm center is northeast of the observer, the wind may suddenly change to the northwest or north, accompanied by a rapid fall in temperature, the change being frequently accompanied by rain squalls and followed by clear skies. At points north of the path of the storm center the winds will first blow from the southeast, will then change to east, and, finally, to northeast or north. The preceding statements can readily be applied to cases in which the storm center is not moving due east. This is done by altering the directions mentioned by a suitable amount. Thus: In the northeastern United States the cyclones usually move toward the northeast, hence a counterclockwise rotation through 45° of all the directions just given will bring these statements into fairly good agreement with the facts.

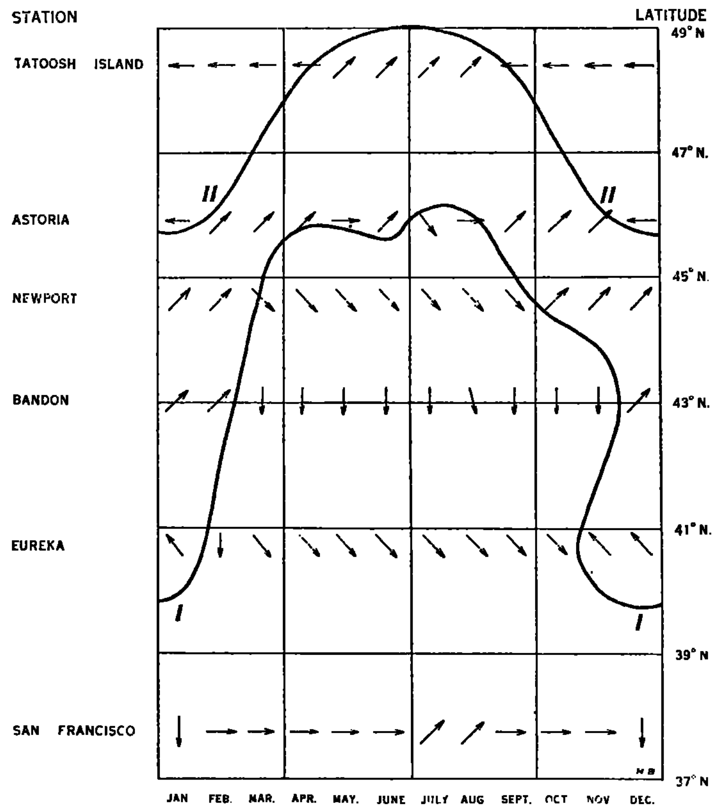

FIG. 1.—Prevailing winds on Pacific Coast.

Local conditions apparently play an important part in determining the directions of the surface winds, so it is generally almost impossible to draw any conclusions from them. An exception is the immediate coast of the Pacific. In figure 1 the prevailing wind directions for every month of the year are given for all the coast stations from Tatoosh Island, three-quarters of a mile west of Cape Flattery, to San Francisco. The data are those given in Henry's Climatology of the United States, 1906, pages 930–989, and cover periods usually considerably in excess of a decade. Taking these stations as a group, the prevailing winds usually blow off the Pacific and should therefore be comparatively free from local disturbances. Curve I separates the months in which the winds usually blow from the northeastern quadrant from those in which winds from the southwest seem to predominate. This curve, therefore, gives the approximate latitude of the center of the high pressure belt where it crosses the shore line at different seasons of the year. Similarly, curve II separates easterly from westerly winds and may be taken as indicating the location of the low pressure belt at different seasons of the year. * * *

[1] Cf. MONTHLY WEATHER REVIEW, April, 1916, 44: 186-196; and June, 1919, 47: 374-390.

Two features of figure 1 require further consideration. The high-pressure belt does not cross the shore line in an east and west direction, but rather from a direction somewhat south of west to north of east. This is due to the presence of the continental HIGH over the United States in winter and to the greater northward movement of the thermal equator over the arid regions of northwestern Mexico and the southwestern States in summer than over the adjoining ocean. In the summer the so-called permanent HIGH is central over the sea, but in winter is central over the land. So in the spring and fall there are periods in which the shift of position is taking place and in which the pressure is fairly uniform over the whole coast. There is, therefore, considerable uncertainty as to the exact location of the center line of the HIGH during these periods. This probably accounts for the peculiar shape of curve I as drawn. If we look upon the permanent HIGH as an actual HIGH, central over the Rocky Mountain States in winter and over the Pacific in summer, the winds issuing from it along the coast would be expected to blow from the northwest in summer and from the southeast in winter. This may account for the southeast winds recorded at Eureka. Elsewhere the effect seems to be inappreciable. It may be noted, in passing, that while these curves were drawn without any reference to pressure charts, the positions of the belts as given here are in good agreement with the charts compiled from the data collected by the Weather Bureau.

A study has been made of the winds of the Mississippi Valley, but without satisfactory results. The local topography seems to play a very large part in determining the prevailing wind directions at inland points. In conclusion some samples of the confusing and disconcerting sets of data met with are given in the following table:

TABLE 1.—*Prevailing winds during all months of the year.*

Station.	Jan.	Feb.	Mar.	Apr.	May	June
St. Paul, Minn.	nw.	nw.	nw.	nw.	nw.	se.
Minneapolis, Minn.	nw.	nw.	nw.	ne.	ne.	s.
Duluth, Minn.	sw.	ne.	ne.	ne.	ne.	ne.
Sandy Lake Dam, Minn.	nw.	nw.	nw.	se.	e.	se.
Keokuk, Iowa	nw.	nw.	nw.	se.	s.	s.
Sublett, Mo.	nw.	nw.	sw.	sw.	sw.	sw.

Station.	July	Aug.	Sept.	Oct.	Nov.	Dec.
St. Paul, Minn.	se.	nw.	se.	se.	se.	nw.
Minneapolis, Minn.	s.	s.	s.	s.	nw.	nw.
Duluth, Minn.	ne.	ne.	ne.	ne.	sw.	sw.
Sandy Lake Dam, Minn.	nw.	nw.	s.	nw.	nw.	nw.
Keokuk, Iowa	s.	s.	s.	nw.	nw.	nw.
Sublett, Mo.	sw.	sw.	sw.	sw.	nw.	sw.

Taken in pairs these stations are in practically the same latitude and are not more than fifty or so miles apart in an east and west direction.

DISCUSSION.

Prof. A. J. Henry suggested that in studies of this kind a consideration only of the prevailing wind might show apparent diversities which do not exist. For instance, in the Mississippi Valley, S. winds and NW. winds may blow for about the same number of hours. At one station the NW. may prevail by a narrow margin, while at a neighboring one the S. may prevail. The use of wind roses would eliminate such apparent discrepancies.

SOME DISCUSSIONS OF WIND OBSERVATIONS: DEESA AND KARACHI, INDIA.[1]

By W. A. HARWOOD.

[Abstracted from review by R. De C. Ward, in *Geogr. Rev.*, 1919, 8:281-282.]

These papers are excellent as examples of methods of discussing wind records, in addition to their value as contributions to the local climatology of subtropical northwest India. "The wind roses show very clearly the seasonal variation in wind direction at Deesa [over 200 miles NE. from the Gulf of Cutch] and the prevalence of winds from westerly and southerly points at Karachi [on the Sind coast at the extreme northwestern end of the Indus delta], except in December and January. Many other diagrams are also included."—ED.

[1] A discussion of the anemographic observations recorded at Deesa from January, 1879, to December, 1904. A discussion of the anemographic observations recorded at Karachi from January, 1873, to December, 1894. With an introduction by G. T. Walker. Diagrs. *Memoirs Indian Meteorol. Dept.*, vol. 19, pp. 275-335. Calcutta, 1915.

EVAPORATIVE CAPACITY.[1]

By ROBERT E. HORTON, Consulting Engineer,

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(Author's abstract.)

The object of this paper is to furnish data showing the relative evaporation rates under standard conditions at different localities throughout the United States. The term "evaporative capacity" is defined by the author as:

> "The maximum rate of evaporation which can be produced by a given atmospheric environment from a unit area of wet surface exposed parallel with the wind, the surface having at all times a temperature exactly equal to that of the surrounding air."*

The evaporative capacity at 112 U. S. Weather Bureau stations has been determined from the meteorological normals of temperature, wind velocity, and humidity, by means of the author's evaporation formula. The coefficients in the evaporation formula were determined by experiments covering two years on a standard Weather Bureau evaporation pan. Maps are given showing evaporative capacities for day and night and summer and winter conditions, and tables are given showing monthly evaporative capacities and day and night time temperatures for each of the 112 stations. The application of the maps and data to problems in hydrology, water consumption by plants and agriculture, is discussed.

[1] Presented before the American Meteorological Society, New York, Jan. 3, 1920.
*Cf. MONTHLY WEATHER REVIEW, Nov. 1919, 47:810 (1st col.).

DEVICE FOR OBTAINING MAXIMUM AND MINIMUM WATER SURFACE TEMPERATURES.[1]

By ROBERT E. HORTON, Consulting Engineer.

Figure 1 is a sketch of a wooden float, which I have found very satisfactory for the purpose of obtaining maximum and minimum water surface temperatures in standard Weather Bureau evaporation pans. In taking the readings, the minimum thermometer is simply tilted up on the pivoted support in the usual manner, to set it. The maximum thermometer is held in position on the pivot support by a wire hook marked A.

[1] Presented before the American Meteorological Society, New York, Jan. 3, 1920.